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advantaged the possessor to such extent that not infrequently life has been preserved by it. It is reasonable to assume that the parts have not become so widely unlike in perceptiveness without some cause, and, if the cause alleged is natural selection, it becomes necessary to show that the greater degree of the power possessed by this part than by that has conduced so much to the maintenance of life that an individual in whom a variation had produced better adjustment to needs, thereby maintained life when some others lost it, and that among the descendants inheriting this variation there was a derived advantage such as enabled them to multiply more than the descendants of individuals not possessing it. Can anything like this be shown?

That the superior perceptiveness of the forefinger-tip has thus arisen, might be contended with some apparent reason, as such perceptiveness is an important aid to manipulation. But how about the back of the trunk and its face, or the tip of the nose, or the thigh? The survival of the fittest cannot explain these differences of perceptiveness. But if there has been in operation a cause which it is now the fashion to deny, the various differences are at once accounted for. This cause is the transmission of inherited traits or characters.

(Here Mr. Spencer records some experiments which show that constant exercise of the tactual nervous structures leads to further development, to greater discriminativeness. The perceptiveness of the finger-ends of the blind who read from raised letters and of compositors is greater than that of the finger-ends of other people.)

Now, if acquired structural traits are inheritable, the gradations in tactual perceptiveness are the result of the gradations in the tactual exercises of the parts. The trunk has but little converse with external bodies, and it has but small discriminative power; what power it has is greater on its face than on its back, corresponding to the fact that the chest and abdomen are more frequently explored by the hands, this difference being probably in part inherited from inferior creatures. The middle of the forearm and the middle of the thigh are obtuse, having rare experience of irregular foreign bodies. The tip of the nose has considerable tactual experience, hence its greater perceptiveness. The inner surfaces of the hands are more constantly occupied in touching than are the back of the hand, breast, forearm, forehead, while the tips of the fingers come into play not only when things are grasped, but when things are felt at or manipulated. If then it be that the extra perceptiveness acquired from extra tactual activities, as in a compositor, is inheritable, the gradations of tactual perceptiveness are explained.

The tip of the tongue exceeds all other parts in power of tactual discrimination; why such perceptiveness? Its functions of moving food during mastication and of making many of the articulations constituting speech, are not materially aided by extreme perceptiveness, and natural selection cannot have caused it. But assume inheritance of acquired traits, and there is no difficulty, for the tongue-tip has, above all other parts of the body, increasing experiences of small irregularities of surface. It is in contact with the teeth, and either consciously or unconsciously is continually exploring them. There is hardly a moment in which impressions of adjacent but different portions are not being yielded to it by either the surfaces of the teeth or their edges. No advantage is gained; it is simply that the tongue's position renders perpetual exploration almost inevitable; and by perpetual exploration is developed this unique power of discrimination.

Thus the law holds throughout, from this highest degree of perceptiveness of the tongue-tip to its lowest degree on the back of the trunk; and no other explanation of the facts seems possible.

But some biologists might contend that *panmixia* affords an adequate explanation of the facts. So Mr. Spencer, after pointing out that the explanation by *panmixia* implies that these gradations of perceptiveness have been arrived at by the dwindling of nervous structures, and hence makes an unproved and improbable assumption the basis of the argument, proceeds to establish that, even with this objection passed over, it may with certainty be denied that *panmixia* can furnish an explanation. As this part of the essay is left unfinished, it would be unwise to attempt an

abstract of the Spencerian criticism of the *panmixia* explanation. We shall return to the subject as soon as Mr. Spencer brings his argument to a close.

#### FEEDING-LINES OF A LIVING LAND GASTEROPOD ON LICHENED SLATE.

BY J. B. WOODWORTH, SOMERVILLE, MASS.

IN searching for fossils in the Carboniferous rocks of Attleboro, Mass., about three years ago, I found on the surface of a vertical stratum of micaceous slaty sandstone, in an old quarry, what at first glance appeared to be annelid trails resembling the form known as *Nereites* common in the Silurian. Further examination showed me at once, however, that these markings were caused by the gnawing away of a drab-colored crust of lichens and dust which concealed the real appearance of the rock. The trails were in the form of bands about one-quarter of an inch wide, wandering over the surface of the outcrop, or curved back and forth on each other, so as to approach but rarely cross. These bands or trails were made up of a series of crescentic cross-markings united alternately right and left with the next adjacent in the series so as to form a continuous, closely pressed, sigmoid line, which in itself constituted the whole of the trail. The trail was evidently the feeding-line of some animal. Another occurrence which I have more recently observed in Bristol County, Mass., exhibited a trace of slime along the feeding-line, such as is left by slugs or land snails, thus showing that the feeder was probably a gasteropod.

Ebenezer Emmons, in the *Agriculture of New York*, Vol. I., 1846, p. 68, describes a trail found upon the surface of the fine green slate of Salem, Washington Co., N. Y., included in his "Taconic System," to which he gave the name *Nemopodia tenuissima*. The figure of this trail on pl. 14, fig. 1, of that work, agrees closely with the Attleboro trails. In an explanatory note, p. 365, Emmons states that this trail has been shown, he thinks, satisfactorily by his friend Dr. Fitch, "to be formed by some living unknown animal." It seems to me highly probable that the trail observed by Emmons, and shown to be not a fossil by his friend Dr. Fitch, was also that of a gasteropod. Conchologists may be familiar with the animal which makes these tracks, if I am right in thinking that they are made by gasteropods at all. As yet I have been unable to catch the animal at its work.

#### NOTE ON THE GENERIC NAME CHIROTES.

BY LEONHARD STEJNEGER, CURATOR DEPT. REPT. AND BATR., U. S. NAT. MUSEUM, WASHINGTON, D. C.

THE application of the law of priority necessitates the abolition of Cuvier's name *Chirotes* for the "Two-handed Ground Worm." No less than three generic names, formally proposed and diagnosed, have priority over *Chirotes*, none of which is pre-occupied, and which in turn would have to be adopted, should any of the older ones for some reason become unavailable.

Bonnaterre seems to have been the first to give a Latin name to La Cèpede's Cannelée, and to recognize its generic distinctness. However, by sheer carelessness he neglected to do so and a solitary "B" stands for the generic name he intended to impose. It may be assumed that he meant to call it *Bipes*, but we have nothing to do with assumptions. At the same time he included as the second species of his intended genus, Pallas's *Lacerta apus*, under the name *B. sheltopusik*.

Latreille, however, saw the incongruity of uniting the two in the same genus, and expressly restricted<sup>1</sup> the name *Bipes* to the *B. canaliculatus*. The genus was thus formally established, named, diagnosed and restricted in 1802 as *Bipes*. Bonnaterre's other species he made a separate genus, *Sheltopusik*,<sup>2</sup> renaming Pallas's species *Sheltopusik didactylus*.<sup>3</sup> The latter will therefore stand as *Sheltopusik apus* (Pall.). It will be observed that this

<sup>1</sup> "Nous ne connaissons encore qu'une seule espèce bien distincte de ce genre."

<sup>2</sup> Latreille, Hist. Nat. Rept., II., 1802, p. 271.

<sup>3</sup> Latreille, tom. cit., p. 273.

generic appellation antedates Daudin's *Ophisaurus*, of the type which is our glass-snake, *O. ventralis*. Boulenger regards both species as congeneric, and if he respects the law of priority he will have to call the latter *Sheltopusik ventralis*. It is hardly probable, however, that any American herpetologist will follow him in placing the Eurasiatic species with two posterior legs in the same genus as the totally legless North American species.

According to the above there can be no doubt but that the generic name for the *Chiroteles* must stand as *Bipes*, and the family name will, accordingly, be *Bipedidae*. The synonymy of the genus is as follows:—

**Bipes LATREILLE.**

1802.—*Bipes* LATREILLE, Hist. Nat. Rept., II., p. 90 (type *B. canaliculatus*).

1804.—*Microdipus* HERMANN, Obs. Zool., p. 289 (same type).

1811.—*Bimannus* OPPEL, Ord. Rept., p. 45 (same type).

1817.—*Chiroteles* CUVIER, Regne Anim., 1st ed., II., p. 57 (same type).

Species: *Bipes canaliculatus* Bonnaterrae.

**THE RAVAGES OF BOOK WORMS.**

At a meeting of the Massachusetts Historical Society, held Feb. 9, 1893, Dr. Samuel A. Green, after showing two volumes that had been completely riddled by the ravages of insects, as well as some specimens of the animals in various stages, made the following remarks:—

For a long period of years I have been looking for living specimens of the so called "book-worm," of which traces are occasionally found in old volumes; and I was expecting to find an invertebrate animal of the class of annelides. In this library at the present time there are books perforated with clean-cut holes opening into sinuous cavities, which usually run up the back of the volumes, and sometimes perforate the leather covers and the body of the book; but I have never detected the live culprit that does the mischief. For the most part the injury is confined to such as are bound in leather, and the ravages of the insect appear to depend on its hunger. The external orifices look like so many shot-holes, but the channels are anything but straight. From a long examination of the subject I am inclined to think that all the damage was done before the library came to this site in the spring of 1833. At all events, there is no reason to suppose that any of the mischief has been caused during the last fifty years. Perhaps the furnace heat dries up the moisture which is a requisite condition for the life and propagation of the little animal.

Nearly two years ago I received a parcel of books from Florida, of which some were infested with vermin, and more or less perforated in the manner I have described. It occurred to me that they would make a good breeding-farm and experiment station for learning the habits of the insect; and I accordingly sent several of the volumes to my friend Mr. Samuel Garman, who is connected with the Museum of Comparative Zoölogy at Cambridge, for his care and observation. From him I learn that the principal offender is an animal known popularly as the Buffalo Bug, though he is helped in his work by kindred spirits, not allied to him according to the rules of natural history. Mr. Garman's letter gives the result of his labors so fully as to leave nothing to be desired, and is as follows:—

MUSEUM OF COMPARATIVE ZOÖLOGY, CAMBRIDGE, MASS.,  
Feb. 7, 1893.

DR. SAMUEL A. GREEN, BOSTON, MASS.

Sir:—The infested books sent for examination to this Museum, through the kindness of Mr. George E. Littlefield, were received July 15, 1891. They were inspected and, containing individuals of a couple of species of living insects, were at once enclosed in glass for further developments. A year afterward live specimens of both kinds were still at work. Besides those that reached us alive, a third species had left traces of former presence in a number of empty egg-cases.

Five of the volumes were bound in cloth. On these the principal damage appeared at the edges, which were eaten away and

disfigured by large burrows extending inward. Two volumes were bound in leather. The edges of these were not so much disturbed; but numerous perforations, somewhat like shot-holes externally, passed through the leather, enlarging and ramifying in the interior. As if made by smaller insects, the sides of these holes were neater and cleaner cuttings than those in the burrows on the edges of the other volumes.

The insects were all identified as well-known enemies of libraries, cabinets, and wardrobes. One of them is a species of what are commonly designated "fish bugs," "silver fish," "bristle tails," etc. By entomologists they are called *Lepisma*; the species in hand is probably *Lepisma saccharina*. It is a small, elongate, silvery, very active creature, frequently discovered under objects, or between the leaves of books, whence it escapes by its extraordinary quickness of movement. Paste and the sizing or enamel of some kinds of paper are very attractive to it. In some cases it eats off the entire surface of the sheet, including the ink, without making perforations; in others the leaves are completely destroyed. The last specimen of this insect in these books was killed Feb. 5, 1893, which proves the species to be sufficiently at home in this latitude.

The second of the three is one of the "Buffalo Bugs," or "Carpet Bugs," so called; not really bugs, but beetles. The species before us is the *Anthrenus varius* of scientists, very common in Boston and Cambridge, as in other portions of the temperate regions and the tropics. Very likely the "shot-holes" in the leather-bound volumes are of its making, though it may have been aided in the deeper and larger chambers by one or both of the others. The damage done by this insect in the house, museum, and library is too well known to call for further comment. Living individuals were taken from the books nearly a year after they were isolated.

The third species had disappeared before the arrival of the books, leaving only its burrows, excrement, and empty egg-cases, which, however, leave no doubt of the identity of the animal with one of the cockroaches, possibly the species *Blatta Australasica*. The cases agree in size with those of *Blatta Americana*, but have thirteen impressions on each side, as if the number of eggs were twenty-six. The ravages of the cockroaches are greatest in the tropics, but some of the species range through the temperate zones and even northward. An extract from Westwood and Drury will serve to indicate the character of their work:—

"They devour all kinds of victuals, dressed and undressed, and damage all sorts of clothing, leather, books, paper, etc., which, if they do not destroy, at least they soil, as they frequently deposit a drop of their excrement where they settle. They swarm by myriads in old houses, making every part filthy beyond description. They have also the power of making a noise like a sharp knocking with the knuckle upon the wainscoting; *Blatta gigantea* being thence known to the West Indies by the name of drummer; and this they keep up, replying to each other, throughout the night; moreover, they attack sleeping persons, and will even eat the extremities of the dead."

This quotation makes it appear that authors as well as books are endangered by this outlaw. With energies exclusively turned against properly selected examples of both, what a world of good it might do mankind! The discrimination lacking, the insect must be treated as a common enemy. As a bane for "silver fish" and cockroaches, pyrethrum insect powder is said to be effectual. For a number of years I have used, on *Lepisma* and roach, a mixture containing phosphorus, "The Infalible Water Bug and Roach Exterminator," made by Barnard & Co., 7 Temple Place, Boston, and, without other interest in advertising the compound, have found it entirely satisfactory in its effects. Bisulphide carbon, evaporated in closed boxes or cases containing the infested articles, is used to do away with the "Buffalo Bugs."

Very respectfully yours,

SAMUEL GARMAN.

MR. FREDERICK VERNON COVILLE has been appointed botanist to the Department of Agriculture in place of Dr. George Vasey, deceased. Mr. Coville has been for some years past one of Dr. Vasey's assistants.